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Staff Workshop on Draft 2013 Building Energy Efficiency Standards Revisions for Residential and Nonresidential Buildings	)

Energy Research and Development Division

Staff Workshop on Benefits Assessments

CALIFORNIA ENERGY COMMISSION
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TUESDAY, JUNE 21, 2011
10:00 A.M.

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STAFF

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Also Present (* Via WebEx)

Presenters

Bruce Wilcox
John Arent, Architectural Energy Corp. (AEC)
Dimitri Contoyannis, AEC

Attendees

Mike Gable, Gable Associates
Mike Hodgson, Con-Sol Representing CBIA
George Nesbitt, CalHERS
Jon McHugh, McHugh Energy
*Roger Morrison
*Tianzhen Hon, LBNL
Patrick Eilert, PG&E
*Jamy Bacchus

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P R O C E E D I N G S

JUNE 21, 2011 9:31 A.M.

MS. BROOK: Good morning, this is Martha Brook, from the California Energy Commission. We're going to start our workshop today. We're talking about the 2013 Standards -- Building and Efficiency Standards Update. And today we're talking about the Residential and Nonresidential Alternative Calculation Method Manuals and Software proposed changes. So, uh, if you've taken a look at the agenda you know we're not talking detail about all of the specific performance rule changes that we'll be proposing. We're not ready to do that -- we're going to do that, probably sometime in August. Today we're going to talk about process changes, as far as the way our manuals will be put together and distributed and the plans that we have for publically available compliance software, and some changes on the Nonresidential ACM that we want to think about in terms of how to calculate the performance energy budget that a proposed building is compared to. So that's, in summary, what we're going to be talking about today. We're going to do Residential in the morning, a break for lunch, and then do Nonresidential in the afternoon.

The first item on the agenda is an overview of our plans for compliance software development. So, in

general this -- and the -- everything that I'm going to talk about in this -- uh, in this item is pertinent to both Residential and Nonresidential compliance software, and when I differentiate it will be obvious because the slide will explain that. But, in general, what we're trying to do here at the Commission is provide open-source software and develop software to be used for performance-based code compliance in a way that can -- people can license the software under an open-source licensing agreement. We have two technical support contracts that will be approved at the Business Meeting later in June, and hopefully we'll start in July to develop the compliance software components. There was an RFQ that was -- that went out in -- earlier in 2011 and we recruited and selected technical support contractors to help us with this effort. We're -- in those contracts we have established a scope of work for establishing and convening a Program Advisory Committee, and we're using this committee to try to facilitate the collaboration and -- because we are trying to set up an infrastructure and a platform where there can be multiple funding for this type of public goods, building energy analysis software. We think there's many applications of this beyond California's performance-based standards, and we'd really like to get other

people involved in this collaboration. So, we're looking for Program Advisory Committee members to step in and, you know, join with us in this effort. The other thing the Program Advisory Committees will do is to set the Quality Assurance standards for the software. And also discuss and recommend to the Commission what type of open-source licensing ought to be used for this software.

The software development efforts include a number of things; Standards Data Model -- so basically establishing terms -- vocabulary terms -- that will be used in the implementation of the performance rules. And this will actually help in a number of ways, even in our code writing, because we'll start to use the same terms for the same elements of the standard, and not use multiple terms for the same item, or not use one term for multiple items. So we're doing quite a bit of work in the Standards Data Model effort, which I think in the long-run will be very valuable to us.

Performance Standards Rule Sets is a way to use that Standards Data Model, along with logical operators, to basically implement the performance standards. So when terms -- when an item in a proposed building needs to be constrained within a range of values or needs to be set to a specific value, that's -- those are what we call

the rules, and will be encapsulated in this rule set, along with the data model terms that basically describe the items in our Standard.

The Rules Processing Software will basically take a rule set and do the work to actually, uh, apply those rules to a proposed building model and run a building simulation. And if there's, if there's a standards design that needs to be generate based on the rule set, that standard building design will also be generated and simulated and then the results computed and reported back. So that's all of the things that the Rules Processing Software needs to do. Along with that is Compliance Forms Generation, so the idea is that there could be one piece of software that generates the compliance forms and vendors would not have to do that work independently. We could leverage this public body of software to -- you know, vendors could have an API or a DLL plug in that basically generates the forms for them based on a specific set of information.

The California Simulation Engine Enhancements is another part of this scope of work. We have a California Simulation Engine that Bruce presented at a workshop back in September, we're going to talk about that again today. And we do need to make some enhancements to that simulation engine, and Bruce will

talk about that a little bit.

So then the Compliance Engine piece - and this will probably be clearer on a future slide where there's a diagram -- but the Compliance Engine basically encapsulates the Simulation Engine with the rules processing software and the compliance forms generation, and, you know, all the necessary data that needs to drive, the -- establishing the performance designs into a piece of software that we're calling the Compliance Engine, which is -- basically allows the performance standard to be computed and results reported out. And so the idea is that any third-party vendor could take that Compliance Engine and build an interface to that, to that -- you know, Application Programming Interface, or API, and be able to basically develop compliance software that could then be submitted for certification back to the Commission. So, that will, I think, become clearer when we show a diagram in a following slide.

And then finally the scope of work for these technical support contracts includes developing a -- you know, a public version of the compliance software -- this is an obligation that the Energy Commission has, and we continue to interpret our mandate as requiring the State of California to provide some public version of this compliance software, which is basically the

Compliance Engine plus some user interface that allows somebody to take a proposed design and apply our performance standard and get compliance results back.

So, for the residential software plan, this is a diagram of what was proposed to us in the -- the winning bid, which is Bruce Wilcox and his team of consultants. So, uh -- I can't do much here -- so basically what -- the only point I want to get across here is what we're really trying to do for the residential software is separate the Building Energy Analysis Simulation Engine from the Performance Rules. And, so CSE is down at the bottom, that's really just pure simulation, so the idea is that other people, other agencies, other organizations that were interested in just residential building energy analysis could actually take CSE and go off and do whatever they wanted with it. So, we are trying to separate these layers, not just because we think it's the best way to implement a performance standard in software, but because it really opens up the ability for us to collaborate with other people, other people to use our open-source software for other purposes that are, you know, in the public good. So that's -- that's what we hope happens in the future by clearly articulating and separating these layers of software.

The middle layer, the Compliance Engine, is where the rules get encapsulated and the necessary data, like the time-dependent valuation, uh, multipliers to the energy results and the weather files and, you know, construction -- information about construction assemblies and schedules for occupancy and internal loads -- all of that is, in one way or another, bundled in the Compliance Engine layer, and the details about which things are clearly inside the engine as an API, versus outside source-code, but by whether or not data should be outside source-code and just accessed, or whether the data is encapsulated in the API are thing with the pack will work out. So those details were not specified in the solicitation that we let. They'll be details that we determine in the next few months.

And then on top of -- the highest layer is the user interface that would access the Compliance Engine through some sort of, you know, electronic data exchange and interface with the user to get a building described, and then access the Compliance Engine to send the building model details to be simulate -- to basically to get the rules applied and then simulated, and then the results reported back into the user interface layer.

So the same type of architecture is illustrated in this Nonresidential software plan. This was the diagram

that the -- was included in the winning Nonresidential bid, which was Architectural Energy Corporation and their team of consultants. So, uh, so what's illustrated here is that it is basically the stuff -- the items that are, that are fully, you know, fully colored and hard-edged around the block diagram are the scope of work that we're going to be implementing with our support contract, but it illustrates the idea that you could have the same software and just replace the rule set and be able to implement other performance standards. So, for example, in the light pink at the top you could, you could modify or create a new rule set for another version of Title 24, for ASHRAE 90.1 performance standard, for LEED credit type of performance standard and the software could implement each of those rule sets. So there's -- there is quite a bit of functionality imagined here, and envisioned, and actually planned, so, uh -- and then down in the lower right side of the diagram, the other point that's illustrated here is that there's other -- there's potentially other simulation engines. So for -- the biggest difference between what we're planning to do for Residential and what we're planning to do for Nonresidential is for Residential we're really focusing on the California Simulation Engine as the California

Residential Building Energy Analysis tool and we're building all of our compliance functionality on top of that -- separate, but on top of. And in the Nonresidential case we're really building it so that we're not requiring a compliance software to use what we'll be using for simulation, which is Energy Plus, so these light blue boxes on the right indicate that you could actually use our compliance software with other simulation engine in order to get our interpretation of the standards with your simulation engine and compliance reports -- compliance results reported back.

So, on the Nonres side, vendors have a choice of whether they want to take a bundled piece of software that includes Energy Plus and our compliance rules processing capability, and then just add the interface and create the compliance software that's then, uh, approved and certified by the Commission. Or they could take the approach where they just take our rule set and rules processing software but use their own simulation engine, and they could also bundle that into compliance software that's then approved and certified by the Commission. So the reason we're not doing the same thing -- we're not picking one simulation engine for Nonresidential, is that we don't think it's appropriate based on where the market is, where the building

designers are. So building designers are using Energy Plus predominantly right now, they're using DOE 2.2 or virtual environment for their building designs, and we don't -- we're not trying to constrain the market. We're not trying to -- we're trying to get out of where we think we are now, where on the -- for commercial building energy design, designers typically so their design in the different tool and then they use Energy Pro or Equest to do a compliance run, but it's completely separate from their design process and they're not really integrating code compliance and thinking about code compliance with the design work that they're doing. So we're really trying to change that paradigm, where a report on the code compliance can be integrated into their design tool. So that's a clear goal of ours for Nonresidential compliance software.

So, the only thing I didn't want to commit to, uh, a written document is the schedule, so -- so everything's still uncertain because we don't have a contract in place, so we expect to have a contract in place in July. We really -- we really have very aggressive timeline goals, we're trying to get the compliance software completed as close to the adoption date as possible. There's no way we're going to get it done by March 2012, but we're hoping and planning and have resourced getting

the software done by the end of 2012. So, ideally we'll have a full year of experience with the compliance tools before the implementation date of the standards.

Is there any questions?

MR. GABLE: Uh, Mike Gable, Gable Associates. So, Martha, I know you didn't want to try to get into the schedule issues, but I guess the first question is the Standards Compliance Engine, and vendors going through that component, going to be required for certification, or is there going to be a plan B, where the old paradigm of what the vendors are doing currently could suffice if the Standards Compliance Engine is not completed on time?

MS. BROOK: So we, uh, we actually were going to talk about this later on, but that's okay, we can talk about it twice. We do want to talk about and want to propose that Residential compliance vendors use our compliance engine, and nothing else would be acceptable. We want to talk about that and want to hear the issues with that, but, uh, we don't -- you know we're trying to get all possible interested vendors participating in our process. We have this pack, we've got some known vendors already on the Technical Support Contract team, so we're doing everything we can to facilitate them knowing about our work and being able to leverage it and

actually work in parallel to our development to get it done.

MR. GABLE: So, my concern is really that we don't get to a situation where we delay standards again --

MS. BROOK: Right.

MR. GABLE: -- uh, that maybe vendors be interviewed -- one of them is here today, but -- to talk about how much time -- if they were to have to go back of using their old model of not using a standards engine, but to create on their own terms the standards rules the way it's been done for many years, how much time they would need to do that so that if the Standards Compliance Engine isn't done by a certain date, you could say, alright well, then Plan B maybe let the vendors do this on their own one more time until -- because my concern is that if you don't plan that Plan B in advance that the standards will get delayed again some.

MS. BROOK: Okay.

MR. GABLE: Yeah.

MS. BROOK: Do we have any other questions from the audience here in person first, before we see if there's any questions online? No questions?

Okay, so the next item that we're going to talk about

-- the next several items -- is the Residential ACM. And first we're going to talk about the Approval Manual. So basically, right now we have an ACM Approval Manual that talks about two specifically -- two specific things and clearly separate things, and one is the process that software vendors need to go through to get their compliance software certified by the Commission and available for use by the industry. So, that's kind of a big process -- a bunch of process steps of what a vendor has to do to submit something to the Commission and the tests that are done by the Commission and the certification process. The other part of the current manual goes into the -- all of the details about how the rules are implemented in software. And what the Commission staff are proposing for the 2013 update is that we separate those two apart, and the first thing that we have here on the slide is what we would still call the ACM Approval Manual, would just be that first piece of -- it would explain the process requirements for certifying compliance software. This is the document that would be adopted by the Commission as part of the standards rule-making. It would include the, you know, describing the application package the vendor has to prepare and submit to the Commission, the required software capabilities, the optional capabilities, the

software test process using criteria for approval, and the software vendor requirements. So, everything that's in the manual now, that in regards to these process requirements would stay in the ACM Approval Manual. The second manual that the Commission is proposing to develop is what we're calling the ACM Reference Manual, so this is like the companion document to the compliance manuals. It would be approved by the Energy Commission along with the compliance manuals. It would document the performance standard rule set, it would explain the standard data model terms, it would explain each rule applied to the proposed building design, it would explain how to compute the performance budget that the proposed building is compared to, it would document the function requirements of the ACM software, the requirements of data from the user, the reporting requirements, it would explain the details of compliance certification tests, and include references to the CSE documentation. So, uh -- I don't know how to go back -- how to go back? Oh yeah. Look we're already at lunch time. Okay, uh --

(Anonymous off-microphone comment)

MS. BROOK: Yeah. Thanks George.

(Anonymous off-microphone comment)

MS. BROOK: Okay, so, uh -- so the idea that we

have -- well basically the reason for the change is that for a number of code cycles, the body of the ACM manual that dealt with the -- explaining the rules that would be applied in software, uh -- it can't be completed until after the prescriptive standards are completed. And we basically work on the prescriptive standard all the way up until our rule-making starts, and there's no good way to get our performance standard equal in depth and clarity and issue resolution when we haven't had any time to work on it. So the idea is that we would describe -- and we already have sections in the code language, we have Section 141 and 151 that describe the performance standard in code language. So what we would do is do a better job in those sections really articulating what the intent of the performance standard is and the -- kind of the high level steps that would -- that you would be required to compute that performance standard. But all the details that need to get tested and need to have software the test them would be in this reference manual, because we really need another year to develop that, and we think that we will be promulgating better performance standards and the software will be better and our rule set will be clearer and better documented if we separate these and have this basically set of good performance standard reference material

separate, so that it gets approved by the Commission but doesn't get adopted as part of the rule-making. So that's our proposal. That's the biggest change, process-wise, to the performance standard implementation and standards for this code cycle. And I think that if there's any questions we can take them. I've put in a lot of breaks for questions, but we don't have to use them if nobody has questions, we can keep going.

MR. GABLE: Mike Gable. Just a quick one, and we can talk about it later. I think -- I would like to see something like an energy performance use appendix, either in this document or in the Compliance Manual, where there's a concise summary of inputs, range -- acceptable ranges. I mean, all the stuff that's in there, but really compressed and condensed as a summary, so that people using software can refer to it, people doing trainings can refer to it, or if you put it on the shoulders of the ACM vendors to do -- if you create a format for that --

MS. BROOK: Right --

MR. GABLE: -- you could have the vendors submit their software guide and something like that, so that there's something accessible to the public that's clear, that's not wading through a long technical document.

MS. BROOK: Okay. No, and I think that's good.

And I think right now, what happens, at least on the Nonres side -- I have more familiarity with that manual than the Res manual, but we've got all of those things all buried in together. So we have some user requirements, and we have some rule requirements, and we have some process requirements, and they're all kind of muddled together, so I think that's a really good idea, Mike. Thanks.

Yes?

MR. HODGSON: Mike Hodgson, Con-Sol, representing CBIA. Uh, we're talking about software development, which I presume also is going to be form generation?

MS. BROOK: Uh-huh.

MR. HODGSON: So the 1-Rs, 4-Rs, 6-Rs will come out of this process?

MS. BROOK: Right, and that -- just to make another point, that's another reason why -- the compliance forms is sort of in the same boat, where, if you put them in the manual, which is where they are now where you have to generate all these forms -- we haven't even figured out what the forms should be yet -- the point -- the rule-making, so that's just another reason to make the separation.

MR. HODGSON: But this process is going to have,

it sounds like, a public domain engine that's going to be generating those forms, is that correct?

MS. BROOK: Uh-huh.

MR. HODGSON: Okay. So, is the process also, then, going to allow enter into the registries? Is the Energy Commission thinking, then, about finally putting a robust registry together which doesn't exist today?

MS. BROOK: Yes.

MR. HODGSON: Okay.

MS. BROOK: So, and I'm just looking at Mazier -- we probably need to talk about that. We don't have it on the agenda today, but we have plans to develop a repository that connects with the registry so that the Commission, actually, is collecting compliance information.

MR. HODGSON: Yeah, I think -- well, the way the system's working right now is somewhat klutzy, and having the Commission -- if the level of sophistication of this software is to the point we anticipate, then I think the registry could be on the same level and it would be much easier and integrated at this one time, rather than sending it to places it may or may not exist, or may or may not be responsive.

MS. BROOK: Uh-huh.

MR. HODGSON: Uh, second kind of global -- our

software is relatively complex, or modeling is very -- I probably -- we think is very good here in California, compared to other places, but our standards are relatively unenforceable. So, one of the things the building industry has been pushing for is buildable packages. And so, we're anticipating that there is going to be packages in the next, I think, two weeks or so that are going to be coming out, that are not going to really take the place of this performance, but it's going to give us options, so that if we do 26 things, and we do them with, possibly, third-party, you know, verification, then we don't have to go through the modeling, etcetera. So I just want to --

MS. BROOK: That's --

MR. HODGSON: --make sure that's still the intent of the Commission.

MS. BROOK: That's absolutely -- absolutely the intent. So we are, uh, we are planning to talk about the Residential packages, uh, on July 15, and the other plans that we have are, uh, while we might have a limited number of packages in our code language, in our reference material we'll have alternative options that will be part of our Compliance Manual.

MR. HODGSON: Great. Happy to work on that with you.

MS. BROOK: Any other questions from the audience? You're good?

Okay, so the next up is Bruce's presentation on the Compliance -- oh darn. I pushed a button down -- okay.

(Anonymous off-microphone comment)

MS. BROOK: Oh, I -- I can do that. I wonder if I can do that. How did I get out of here? Maybe not -- I'm not smart enough --

(Off-microphone conversation fixing PowerPoint)

MR. WILCOX: Good morning everyone. Uh, can you hear me okay? I'm Bruce Wilcox and I'm the prime contractor for the Residential Standards Support contract team. And, I'm going to give you a brief, uh, overview of the new California Simulation Engine, CSE for short, which Martha was referring to in discussion the Residential standards. So, I liked Martha's pictures so much that I put it in my presentation as well. This is the way we like to think about software on my team, and mostly Bugatti is really our thing, so uh -- and we really -- I think in some ways we actually have done this in the CSE engine, so it's very uh, sort of uh, muscular. So what I want to talk about it -- oh, typos -- uh, background and history -- that should say "history" instead of "istory" -- uh, and then I want to talk -- just give you a brief overview of some of the

CSE new features, the network that we're using now versus what we used in the past, how we're dealing with surfaces, our new airflow calculation -- airflow and network -- and one of the big advances is the new, uh, window algorithm that we've implemented in this -- in CSE. There's a software consortium website where the -- if you're interested in the software you can actually download the current, uh development version that's being used to work on the draft standards and is running the current development version of this software and try it out. And then we'll have questions, although I'm happy to answer questions from people in the audience if there's things that come up as we go along.

This is that same picture that Martha showed earlier, uh, and the piece -- I just wanted to emphasize -- that the piece we're talking -- that I'm talking about here is this box, down at the bottom, the California Simulation Engine, which is the piece of the software -- Residential software system that, uh, calculates the loads and energy use of a building that's been defined and set up using all of the other stuff here. So, it's the -- it's kind of the -- it's the nuts and bolts calculator, is one way to think about it. And that's what I'm going to talk about.

So this CSE engine was developed in a project that's

been going on now for a couple of years. The project development was supported by the Energy Commission and the California Statewide Utilities Codes and Standards Program. And, so it's already a shared development project, in that it's not simply the Energy Commission, but it's also, uh, been supported by the California utilities who have interest in these areas as well. Uh, the idea behind this project was to build on the, uh, UZM model and field data that we had accumulated recently. The UZM model is, uh, -- UZM stands for Unconditioned Zone Model, and it was developed to model attics with duct systems in them. It was also -- it was developed by a PIER project in -- and was ultimately adopted in to the 2008 Residential software and is being used right now in the compliance models that are being used for compliance. And, uh, when we developed that model we learned a lot about how to make things work better on a detail level and improve the accuracy and sophistication of the simulation models compared to what we've been doing in the past, so, uh, the idea in the CSE project was to take that same approach to the simulation of the condition zones in the building. And, uh, the goals that we had in the development were to more accurately estimate solar gain impacts on cooling energy and peak load. Uh, solar gain is the big driver

of -- or one of the big drivers of -- cooling energy use in California buildings, and there was a lot of criticism that the prior simulation models were not doing a good job of calculating solar gain impacts, particularly on peak loads.

A second goal was to, uh, improve the way that the building shell and interior thermal mass was interacting with cooling loads and indoor temperature variations to improve the treatment of mass in a simulation. So I think we've focused on that to a great degree.

And then the third one, and a very important goal in this effort, was to improve the modeling of ventilation, and it's interaction with building mass and impact on cooling energy and peak load. And we've made a number of improvements in that area, and those are actually having a big impact on the development of the 2013 standards, I think. And then the -- there were also goals to add new capabilities for comfort analysis and mechanical ventilation, which hadn't really been dealt with on a very detailed level in the compliance software before.

Uh, a little historical perspective, uh, this CSE engine comes out of a long line of software that has been developed for and used in the -- in one way or another - in the building standards. It really derives,

in many ways, directly from a program called Calpas One, which Phil Niles developed as part of a CEC project to write a California Passive Solar handbook in 1980. So the original program was developed to figure out how to advise people on, you know, how big to make their windows, or how much thermal mass to put in their passive solar house. But that -- in the end, the program was also deliverable to the Commission and became available. And then a number of different programs were developed out of that, including Micropas, and so forth. Then there was the Calres public domain computer model that, uh, was developed for the Commission in 1989, and I was the project manager on that, so I know that went pretty well. So that was a validly public domain Residential model that in some ways is a similar kind of role that is being proposed for the software that we're developing for the 2013 standards. Uh, a further version of this same simulation software was incorporated as the simulation engine for Energy-10, which was a pretty well-known small commercial building design tool that was produced by the Natural Renewable Energy Laboratory and released in 1996. And the current, uh, the current CSE code is actually pretty straight derivation of the engine that was in Energy-10, with a lot of changes and

improvements. And then the, as I said earlier, the UZM, the attic model that we developed for the Commission in 2007, and then now the CSE, which is the -- its new proposed Residential Simulation Engine that we're talking about. So there's a -- there's a long history here of both of the public domain, publically supported software development, and also this same sort of approach in code-base.

The Calpas One had a very simple model, it was -- it was developed in the days when microcomputers were really micro, and their capabilities were very limited. So the primary network components in Calpas One is you have a solar gain calculation for sun coming through windows and then you had the -- you -- the total UA -- the total, uh, conduction through the -- all the envelope components of the building - windows, infiltration, ventilation, walls, and roofs, and so forth. It was all lumped together in one component that connected the indoor air to the outdoor with a UA value. Uh, all the solar gains and all the other gains were added to this air temperature note in the middle, and there was some mass connected to that to actually represent the building. The program actually had the capability of doing layered walls but that was really only for special cases, like trombe walls and things

like that, that people rarely ever did anything with. So it was a very simple, uh, simplified version.

In the 2008 UZM attic simulation model, uh, as I said earlier, this was developed as kind of a stand-alone add-on to the compliance software. And for the first time we did a very detailed model of the attic, which has a lot of convection and radiation are treated separately. There's a -- the ducts in the attic are a component in the attic simulation connected by convection and radiation to all the other elements in the attic. There's conduction and infiltration to the ceiling, to the attic temperature, rather than the outdoor temperature, and ventilation through the attic is treated with a pretty careful model. So this is a very different scale of model than we've been using in the Calpas One kind of model. So then, when we tried to take that approach and use it for the condition zone, and we winded up with a much more complicated system, and I don't want to go into the details here, but the fundamental improvements are that radiation and convection are in the interior spaces are treated separately. There are -- all of the exterior surfaces now are treated as multi-layer mass models, so that all of the time lags and so forth are handled correctly. Uh, and we now have a much better window model that

we'll talk about in a few minutes that does a better -- a much better job of calculating solar gain and so forth. So major improvements in the way the network is being handled.

So, some -- in words here -- CSE features that include that all parts of opaque surfaces -- the frame -- including the frame and cavity separately, are calculated separately as mass elements -- walls, floors, ceilings, interior walls, furniture -- so that the full interaction of all that massive parts of the building are handled. There's separate radiant and convective heat transfer for all surfaces, there's a pressure flow air network for infiltration, ventilation, and HVAC interaction. This is actually a, I think, a very advanced algorithm, and I don't know of any other, sort of, production simulation program in use in Residential that actually has this approach to calculating the combined effects of infiltration and ventilation. And then we have the ASHWAT Minda model, which is, as I said earlier, is a full hourly variable propertied calculation for windows, including interaction with interior and exterior shading devices.

So, a little more detail on some of the components here. Opaque surfaces, the building envelope, all the surfaces are dealt with as multi-layer mass surfaces.

The frame and cavity are separate surfaces in the calculation, so that the mass of, for example a wood frame wall, the mass of the wood studs is dealt with in a realistic way. And there's a library input for all the common constructions, which is greatly expanded, versus what was done in previous versions of the standard, I think. We've improved the implementation of the slab model that we first did in the 2008 standards based on the slab model that Joe Huang and Bajanac developed for the Energy Commission, and we're now doing explicit thermal mass elements inside the building, including furniture, interior walls and floors, and so forth. And this is, in the compliance world, a function of the condition floor area, CFA, this library and the number of stories in a building. Uh, the model includes still all the features of the UZM attic and duct model, and CSE is slightly modified from the 2008 UZM, but the basic concept is still the same. All or part of the duct system can be in the attic zone, convection and radiation between the ducts and the attic air and surfaces is all handled, and leakage from and to the attic air is part of the model. This is a real important feature when you're dealing with cooling energy calculations and the ducts are located in a hot attic, because, uh, you really don't get the right

answer unless you can, uh, account for the fact that the air temperature in a unimproved attic in California in the summer time is often above 140 degrees. And so, when you have duct leakage and conduction and so forth, it's not with outdoor air, it's with this super-heated oven, which you made part of your house and then put the air conditioning system in there. And I think that this is an important improvement in the calculation world.

New in this CSE implementation of the attic model is the ability to handle unbalanced duct leakage. And when the ducks, when there are larger supply leaks than return leaks, for example, which is a typical case, then whenever you turn the air conditioning system on, you actually induce a pressure difference across the building and so you increase the infiltration rate of the house. And that is something that we've all known about for a long time, but it never included in the distribution efficiency calculations in the building standards, but it's now built into this CSE model. And then we're also doing a more sophisticated job of calculating infiltration between the house and the attic using the air network, and I'll talk about that in a few minutes. That has a big impact also.

So, here's this airflow network we were talking about, kind of diagrammed in a very simplistic way.

This is if there's just a single zone house and an attic, and that air temperature in each of those is these kind of -- whatever they are, I think they used to be yellow, but they've kind of transformed here in to something kind of icky. But the icky notes here are the air temperatures. And then between those you have pressure flow, you know natural infiltration flows due to differences in pressure through leaks in the ceiling and through leaks in windows if windows are open between the inside and outdoors. In addition to that you also have fans that can be -- these little "x" symbols here symbolizing fans that blow air in or out of the house to outdoors, in or out of the house to the attic. And when they do that they change the pressure in the house and the attic can cause further air leakage. And then in addition you have the duct HVAC system, that as I said earlier, the leaks from the ducts, the supply leaks and return leaks change the pressure in the house and the attic and cause additional air flows through the envelope. This is all done in an integrated way, so that we can actually see what happens when you turn on the exhaust ventilation system in the house and how does that change the infiltration in the house and the attic. We have included in this development version of the Residential software, a model for whole house fans,

where you put a very large fan in this position and blow air from the house into the attic, and that -- accounting for that in a detailed way has allowed the CEC to now propose that there will be a requirement for whole house fans in certain climates, based on the calculation showing that they actually work pretty well to save energy.

MS. BROOK: Bruce, you had a question from Mike.

MR. WILCOX: I'm sorry --

MR. HODGSON: Mike Hodgson, Con-Sol. So you can do intermittent ventilation?

MR. WILCOX: Uh, at the moment we don't -- you could do intermittent ventilation. We don't actually have any input set up for intermittent ventilation at the moment.

MR. HODGSON: But I would assume that's how you did attic fans is some type of -- I mean they're not on all the time, and --

MR. WILCOX: No, no -- they're -- but they're -- the current input for all the ventilation stuff assumes that you're scheduling things on an hourly basis, or in the case of if you're running on a thermostat like you would with a cooling ventilation system, that it would run intermittently, yes.

MR. HODGSON: But could you calculate the

pressure differences putting in kitchen intermittent ventilation or clothes dryers?

MR. WILCOX: Uh, you could. We're not currently doing that, but that's, uh, that's -- that's a possibility, yes.

MR. HODGSON: The question we asked back in 2008 -- and I'm not saying that you had to answer it -- but the question was is, you know, we have closeable doors in our fireplaces, and we have, you know, for ASHRAE 62.2 now require continuous ventilation and we have a -- we really don't know what the negative pressure is generated within the house when we turn on multiple intermittent devices on at a time. And I'm just wondering if you could add to that -- data to that discussion with this model.

MR. WILCOX: Uh, yes we could.

MR. HODGSON: Okay.

MR. WILCOX: Uh, always assuming that, you know, that -- well, we would be generally using average leakage characteristics for, you know, typical houses, and of course it would -- it depends on the leakage of the actual house what the, you know, what happens in any particular case. So this, you know, the average calculations are not -- don't guarantee combustion safety in every house.

MR. HODGSON: Yeah, I just -- what we're kind of after is there's an issue in the field right now with large range hoods, and make up air, and how significant an issue is that. And there's a lot of discussion, but no data. And so you turn on a GenAir and what happens? And, uh, so that, I'm wondering.

MR. WILCOX: Well, uh, one of my test cases was to simulate a blower door test, which is a very large fan --

MR. HODGSON: Uh-huh.

MR. WILCOX: -- and, uh, I think that that works fine in this model and so we could do that kind of -- we could do -- set up a little study experiment and see what it would look like.

MR. HODGSON: I think there's a big issue on indoor air quality and intermittent fans and I think if this -- I mean I know that's not the primary direction of this, but if the software seems to be achieving that -- giving us data for those things, I think we should have a discussion about that because it's a real big issue. And there's some problems in the field over it, but there's also some health studies that we had back in 2007 or -5 or whenever, that we could kind of revisit with some of the simulations offered.

MS. BROOK: Right, and I think that's an

excellent example of how what we're trying to set up for open source public availability of this software is appropriate, because the industry could take the software, ARB could take the software, we could collaborate on it together and do a study like that without having to use any of those other layers that might complicate things because they would constrain the inputs or otherwise get in the way of an analysis when you're really just trying to focus on something like intermittent ventilation, so I think -- thank you for bringing that up.

Bruce, one thing I wanted to ask, and I'm not sure I heard it is, did you talk about the time step that you're simulation? Are you doing this every hour, every fifteen minutes?

MR. WILCOX: Oh, uh, I have not talked about the time step, but uh, the -- primarily because of this particular component of the simulation, the airflow network, uh, but also for mass calculations in order to deal with lightweight surfaces like stud walls and so forth -- we're doing this with a four difference running on a very fast time step by historic simulation standards. And typically -- well, what we're running in the production version currently is a two minute time step for all of the simulation stuff, so, it's -- as I

said, the Bugatti engine is a good thing to have. And it's also, you know, it's a good thing to have multi-core Intel current generation chips, because the simulations now are so fast compared to what we've been used to, even a few years ago, that things -- it's an order of magnitude -- easier to do this kind of simulation than it used to be. Uh, Ken Nittler has a desktop computer that we've been using for testing and production stuff that has six physical cores that runs 12, I guess implicit cores. So, 12 parallel simulations at the same time, and it will run some 500 CSE simulation -- annual simulations an hour. And, so that's pretty impressive compared to years ago, when it used to take, you know, fractions of an hour per run to do these kind of things on a small computer, so that's really changed the environment too. Mike?

MR. GABLE: Mike Gable. What currently exists, or what do you plan for multiple zones for low-rise multi-family buildings, where you want to sometimes have -- well actually in practice you might even have six, seven, eight zones in some weird large projects, so, can the model actually yet do that or is it intended to be developed to do that?

MR. WILCOX: Uh, well the current model is -- that we're using for the standards development is a

single condition zone. But that's -- there's no inherent limitation that says we can't do more zones. The intention in here is that the CSE engine that gets delivered, you know as part of the standards stuff, will do multiple zones. We haven't talked about any specific limits on what you would do with, like, a multi-family building like you are talking about, but there are some limits in the set-up we have now for the duct model that, uh, would have to be thought through about how you'd do that in a multi-family building.

MR. GABLE: Is that -- that's going to be part of the scope of work, though, to deliver for this set of standards? Okay, thanks.

MR. WILCOX: Okay, uh, as I said, the details on the airflow network, the airflows between zones and between zones in the outdoors are calculated based on pressure differences. And that includes temperature and wind effects, and it also includes the -- so we can actually simulate the combined effect of air leakage and ventilation, you know, including infiltration, natural ventilation, mechanical ventilation, duct leakage, all operating simultaneously in the building, and you resolve all the pressure differences and figure out what the flows are. Now this is a big leap forward because we've never done any of the infiltration and ventilation

stuff in combination before. We've always assumed, for example, that when the windows were open you were still getting the same infiltration that you would have had if the windows weren't open, which never mattered very much, but it was certainly silly.

Uh, okay, and then the other big component of -- that where things are improved here is the window model. We've implemented a set of algorithms that -- called ASHWAT, which is a -- this is an acronym for a model that came out of an ASHRAE project that was done at the University of Waterloo in Canada, and so this is -- for those of you who know that window simulation technology, this is very similar to the Window Five and Six models that are used in the DOE 2 world, but has some features that are better in some senses for what we're trying to do. Uh, it does a multi-layer model -- heat-flow model -- of the center of glass in the window, including the exterior screen and an operable interior shade as part of -- as layers in the model. And, so it actually calculates the heat floe between the window and the shade, and between the window and the outside screen, and between the layers of the window in detail. And it's calculating solar gain and heat transfer at each layer. One of the things that this model does for us is gives us a good radiant and convective connections to

use for that room model with the radiant and convective heat transfer model. One of the reasons we added this was you couldn't really do the improved room model without also having a way to model the windows at a more detailed level. And this ASHWAT model is actually pretty well -- pretty solidly based. It was used to produce all the tables in the 2009 ASHRAE Handbook of Fundamentals Glazing Properties Tables. So, it's been vetted and used, and so forth. So, one of the things this -- our implementation here features, we figured out a way to make the inputs to this model for simulation and compliance purposes be the rated U-factor and solar heat gain coefficient of the windows the same numbers that we're using for compliance and for prescriptive standards. And that's, uh, you know, something that I think hasn't really been done before, but we figured out, I think, a very solid and fundamental way to do that. So there's no added complexity here, and basically the model, from the outside, has got all the same inputs you have currently. But it's doing a much more sophisticated job, including calculating the overall U-factor and solar heat gain coefficient hourly or every two minutes, actually, based on the conditions, including the outdoor temperature, the wind speed, the sky temperature, indoor air and radiant temperature, and

the position of indoor and outdoor shades and screens. So, this is actually a fundamental leap in the window simulation technology, and I think it's a real nice and important thing to have.

So, that's my discussion of the CSE Simulation Engine. There is a website that we're maintaining, which we're calling the Building Energy Efficiency Software Consortium, and there's a current development software implementation of CSE that's -- you can get and download there. It used the Micropas Compliance Program as a user interface and compliance manager. We've licensed that Micropas Interface from Ken Nittler to use for the development of the 2013 standards, and it's available for stakeholders and others to use for their own calculations and so forth. And there's the website address right there, in case you're interested. A number of people are using this software now, and we expect that to continue through the development of the standards process. Okay, so if you have any comments, send them to Martha.

(Laughter)

MR. WILCOX: If you have any questions we can talk about them now.

MS. LENTZ: This is from Roger Morrison. He says I believe I heard Bruce use the phrase "improve

attics" in his discussion of the UZM attic model. Can the UZM model simulate vented and unvented attics?

MR. WILCOX: The answer to that is I -- it cannot currently -- in the current -- in the development version model an unvented attic adequately enough, is I guess the way to put it. You can actually do the -- set up the inputs and run the simulation but it's not -- there's a bunch of -- well, not a bunch -- there are a couple of issues that are not handled correctly, and so we expect to actually deal with that and make an unvented attic simulation possibility for the production version of the California Simulation Engine. The problems are things like the, uh, the cooling load calculation that's implemented in the model, which is the California Energy Commission ACM Manual calculation, derived from ASHRAE Handbook of Fundamentals, doesn't know what to do with an unvented attic. It's not part of the -- it was never part of the world that that thing was invented to handle, so, you know, if you run an unvented attic blind into the current model it -- you get screwy answers because the air conditioning system isn't sized right. So, there's those -- it's those level of details that I think that need to be handled correctly and -- before we can allow the -- provide the software that people can use for compliance credits and

so forth through sealed attics, but that's -- our intention is to do that.

MS. LENTZ: This is from Bruce. Uh, his question is can the model accept the data inputs for the tree shading or other shade-producing structures in the proximate zone of the window?

MR. WILCOX: I heard you ask the question as can you use trees or other shade-producing structures, is that the question?

MS. BROOK: The idea -- I think the question is does the model accept inputs for shading -- external shading of windows?

MR. WILCOX: Yeah, they -- well, okay, so the external shading of windows is handled in this model currently with, you can have overhangs and fins on any window. And those are done explicitly and with, I think, a lot of detail and a better algorithm than what's been used in the past to improve the actual calculation. Uh, there is no provision in the current Residential ACM to allow credit for tree shading. So, we don't have any tree shading models in the software, and there's none allowed by the rules currently, so that's -- I don't think, you know, there's nothing for that. And partly because of compliance issues, the standards don't allow you to take credit for things like

other buildings and so forth, unless you wanted to do some kind of an exceptional method calculation or something.

MS. BROOK: So, this is Martha. I would just, again, use this as an example of where for the standards it's not a priority because, as Bruce said, we don't allow credit or -- to be taken for tree shading, but since the software will be publically available there's no reason why somebody couldn't add that functionality to the CSE Engine and the only requirement -- well, there is no actually -- depending on the open-source licensing that's decided on, whether or not that algorithm for tree shading, if it ever gets developed, would have to be placed back into open source along with the rest of the CSE software or not is still open for discussion. We would love to have that kind of collaboration happen, but I think the way that we're thinking about the open-source licensing was that we would not require that. Somebody could take the CSE Engine, do whatever they wanted with it with no obligation of contributing their contributions back to open-source, though we would encourage it if it's something that we see of value to the public.

Are there any other questions? George?

MR. NESBITT: George Nesbitt, CalHERS

Environmental Design Build, Passive House California. For the record, when I don't get enough sleep I'm out to lunch, so, which has been all too frequent recently. Uh, I want to start off and just jump ahead because I think I am going to have to leave early. I think requiring the calculation engine to be used by all compliance software is a very good thing. I think the self-certification of the past, and the fact we have different programs that give you wildly different answers with the same inputs is just not acceptable. So, then I also -- on the separating the software approval requirements from the actual ACM rules, I understand that because until March 2012 we probably don't know exactly what will be in the code. Although, of course to develop the Engine, you'll need to know. And for people to develop an interface, they will need to know how to interface it, but, uh, that's definitely a needed thing. Uh, so in the ACM rules we have minimum modeling capabilities that are required, and optional requirements, which seems out of place under the new, kind of, CEC has a core calc engine. That engine needs to be able to calculate everything that is allowable in the code. Uh, whereas, I think then, what you mean is when someone develops an interface, possibly they may or may not choose to implement certain things that are

allowable to the code, although doing such makes the software worthless to me, if I can't do what I need to and want to. So -- try to keep it on the high level here -- I've seen no mention of HERS-2 ratings. Since a HERS-2 rating software is required to be Energy Code approved software, and we are creating the core engine for that software, does that core engine also need to be able to do the HERS-2 rating? So hopefully we can change the HERS rules and separate the approval of HERS rating software from the approval of the provider and make it separate. So that way Micropas can have a HERS-2 rating module so I can choose to use it because I prefer to use Micropas instead of having a gun to my head and having to use software I don't like, as I am doing with TREAT currently, again after eight years, dealing with bugs and crap.

MS. BROOK: Okay, George, time out. I just want to make sure that I understand what you're saying. So, uh, so from your perspective, if our compliance software could spit out a HERS rating then the only thing -- then the only other thing that you'd be requesting the Commission is to reconsider in a HERS rule-making process, separating the requirement of the rating software from the rating provider.

MR. NESBITT: Correct, as I recommended three

years ago.

MS. BROOK: Yeah, okay, well, sometimes --

MR. NESBITT: I know --

MS. BROOK: -- it will take multiple hits at the microphone --

MR. NESBITT: -- it takes time for it to sink in -- and I know.

MS. BROOK: Uh-huh. Okay.

MR. NESBITT: You've got to hit them until it hurts, and even then it doesn't work. I've got neighbors --

MS. BROOK: So --

MR. NESBITT: -- that haven't figured that out.

MS. BROOK: Okay.

MR. NESBITT: Uh, yeah, you have another question, that's fine. Interrupt me if you don't understand something, or, that's fine.

MS. BROOK: Okay, no -- I'm fine.

MR. NESBITT: And on that -- along that line, more times than not I cannot get the NSHP calculator to work. So, whenever I, as the HERS rater, need to help my solar installers revise my -- the CF1R PVs because they're always wrong, I have to send it to the CEC because I can never get it to work, despite reinstalling and everything. So, can we, can we please squeeze that

in, I mean, you know, that's a big engine.

MS. BROOK: It is a big engine --

MR. NESBITT: There's got to be room in a valve --

MS. BROOK: I think what you don't see --

MR. NESBITT: -- or something for an NSHP calculator.

MS. BROOK: -- what you don't see on that picture is the unlimited fuel supply going into the engine, so I mean --

MR. NESBITT: With dollar signs on it?

MS. BROOK: Yeah. So our resources are very constrained --

MR. NESBITT: I know --

MS. BROOK: -- and I appreciate you, you know, putting this on the record. I think we would love to do all that, we're not committing to do that as part of the 2013's code update.

MR. NESBITT: Yeah. As well as solar hot water calculation.

MS. BROOK: Uh-huh.

MR. NESBITT: And part of it comes back to the HERS-2, because currently -- it took me a lot to figure out how to add the PV in on a HERS-2 rating. And Energy Pro's manuals are virtually non-existent, and not very

helpful, so it took a lot of kind of playing an figuring out and, you know, you have to make some conversions from the output you get from the NSHP calculator, and you know, so that's just a lot of extra work that's unnecessary.

MS. BROOK: Uh-huh.

MR. NESBITT: Uh, and I'll just -- I'll point out, because CalHERS has put the capital R in Rater, and I noticed that on the desk there's books called, you know *Elements of Style* with people's names on it. So, we need to edit all of the manuals, everything the Energy Commission does, where it says HERS Rater -- HERS -- all the letters are capitalized, and Rater is capitalized because it is a title, as well as the P in Provider has to be capitalized. So currently in the ACM, HERS is a capital "h", small e-r-s in some places, the Rater is a small "r", and a capital "r" in others --

MS. BROOK: Oh, okay.

MR. NESBITT: -- so, please, let's do some universal editing.

MR. WILCOX: We'll get all that stuff cleaned up in the Engine, George.

MR. NESBITT: (Laughs)

MS. BROOK: Yeah, there is going to be a special module for capitalization.

MR. NESBITT: (Laughs)

MS. BROOK: And if you come and join us in our collaborative effort, you can build that one.

MR. NESBITT: You'll have to ask my brother, he's the computer genius. I can use them, but don't ask me to program one. Uh, and I mean I am more than happy to help ion the development of such a thing be on the advisory board, whatever.

MS. BROOK: All right.

MR. NESBITT: Uh, there are certainly other little details, things that are missing --

MS. BROOK: Okay.

MR. NESBITT: -- get into reports, but I don't think I really want to get into that here and now.

MS. BROOK: Okay, all right. Good, thanks, George.

Hi Jon.

MR. MCHUGH: Hi. Jon McHugh, McHugh Energy. So I just wanted to clarify a little bit. I thought I heard you just say a second ago that there's not a commitment to try to integrate a PV calculator and solar water heating calculator within the kernel, is that correct?

MS. BROOK: So, uh, I think that we do have that commitment. What I wasn't -- what I want to be careful

of is that we, uh, we understand the -- I don't know all of the other things that are necessary for NSHP, for example, or HERS-2 ratings, and I'm not -- but I, uh -- we do expect in some way or another at least -- so I'm hedging a little bit because I don't want to over-commit. To the extent that we need to have some sort of -- some way to simulate PV, to implement our performance standard we'll do it. But I don't want to make the commitment of integrating all of it if we don't need it just for our standards. It will just be further down on the priority list. So we expect to do it, it's just when we'll do it.

MR. MCHUGH: Expect to do it for meeting Title 24 --

MS. BROOK: Yes.

MR. MCHUGH: -- not necessarily for some program --

MS. BROOK: Right, right.

MR. MCHUGH: -- purposes.

MS. BROOK: -- for beyond code program, that's right.

MR. MCHUGH: Okay, thanks.

MS. BROOK: Uh-huh.

MR. NESBITT: George Nesbitt again. One other last, sort of bigger item, since Con-Sol brought up the

issue of registry for --

MS. BROOK: Uh-huh.

MR. NESBITT: -- stuff. Uh, considering, you know, here again, so each HERS provider has to develop their own registry, and now the Commission wants to develop a repository --

MS. BROOK: Uh-huh.

MR. NESBITT: -- so we're going to have three different people develop three different registries that have to, not only have energy code software communicate to those registries, then those registries have to communicate to the Energy Commission's repository. Considering that we only currently have one HERS provider because two others have basically failed to produce and acceptable registry, uh, rather than developing a repository we really need the -- that Bugatti needs an extra super-charger that's called a Registry, so that providers could build an interface over it, just as we will with the Simulation Engine, which, you know -- I mean, hopefully both of these will, perhaps, stimulate for better and for worse more competition in the marketplace, whereas currently to develop energy code software you have -- you know you would have had to do a lot extra work and expense. Uh, I know it's not in your budget at the moment --

MS. BROOK: No --

MR. NESBITT: -- but it’s an idea that really, I think to get -- we’re going to have to do it.

MS. BROOK: You’re right. It’s very analogous to what we’re doing here and it’s appropriate, and I appreciate the comment.

MR. NESBITT: Yeah. And we’ll just have to figure out who’s got the deep pockets --

MS. BROOK: Uh-huh.

MR. NESBITT: -- how to pay for it.

MS. BROOK: That’s why I keep saying this is a collaborative effort, which means we want money.

MR. NESBITT: I’ve got two twenties and a one in my pocket.

(Laughter)

MS. BROOK: Hello, a question online.

(Anonymous off-microphone response)

MS. BROOK: Okay.

MS. LENTZ: This is from Tianzhen Hon. Uh, he has two questions. His first is, how is a crawl space and basement handled in CSE? Something to UZM?

MR. WILCOX: That was, how was the crawl space being handled?

MS. LENTZ: Uh-huh.

MR. WILCOX: Uh, well, uh, the crawl space is --

hasn’t been being handled and nobody noticed before, so, uh, it’s -- it was actually part of the spec, and it’s part of the software that’s in UZM, but it’s never been implemented in actual simulation software that’s being used because, uh, there wasn’t much interest in priority. And we in the past have ran out -- run out of time and budget. Uh, it’s also way less, in many ways, way less important to the compliance calculations, because the thing that’s driving the attic model importance is the ducts being located up there and the impact on cooling. And you really don’t get that interaction with a crawl space, which is -- never gets hot. Uh, however, it, you know, it -- there are a significant fraction of all the houses that have crawl spaces and it could be, if people wanted to push on the priorities, it certainly could be included in the production version of the CSE.

MR. HON: Thanks. Bruce?

MS. BROOK: Yeah?

MR. WILCOX: Go ahead Tianzhen.

MR. HON: So, should I go ahead to the next question?

MS. BROOK: That’d be great.

MR. HON: Yeah, so this is another question. Sometime I’m talking about it new compliance process.

So I see the Nonres compliance process is much more protected, you know, from gambling them, which is good, and the right direction to go. My question is, talking about these compliance forms, I saw they will be generated automatically. So are these results, you know, will be still printed for submission or, you know, these electronic forms will be submitted automatically, you know, to CEC or, you know, whatever compliance, you know, agent?

MS. BROOK: So, uh, part of that automation is part of the HERS registry process, and to the extent the Commission wants to extend automatic form submission to the Commission through the registry - slash - repository, that's something that we can do. But we're not eliminating the paper compliance to the Building Department path for permitting. So we haven't changed that part.

MR. HON: Okay, that's good, thanks.

MS. BROOK: Are there any other questions?

MR. GABLE: Uh, Mike Gable. Just to reiterate the HERS-2 issue briefly. I think some thinking needs to be done just to know how it's going to -- 2014 HERS-2 rating is going to fit into this whole scheme, because the 2008 standards house, so you can put those measures into the CSE and run that, and that becomes a score of

100. But I think there's probably a lot more to it than that. And I think the Staff needs to figure out how that's gonna kind of work.

MS. BROOK: So, what you're suggesting is that we need to think about whether or not we change the 100 point on the scale?

MR. GABLE: No, I'm just thinking the technical manual is going to have to be realized anyway to reference the new CSE and the new ACM manual, which is the basis of the current HERS-2 --

MS. BROOK: Uh-huh, uh-huh --

MR. GABLE: -- but there might be some other related issues that we could revisit as part of the technical manual, uh, discussions.

MS. BROOK: Okay. Good, thanks. Okay, our last slide on the Residential ACM topic is what -- we've already mentioned this. I'm just going to summarize the Commission's proposed requirement for all Residential software -- compliance software vendors to use our Compliance Engine.

So, just to summarize, the Engine will include the Simulation Engine, CSE, the water-heating DLL, the solar and PV DLLs that aren't listed on the slide to the extent necessary, uh the Residential Rules Set, the rules processing software, the forms generation, and all

data libraries. The benefits of this approach is that it's a single interpretation and implementation of the performance standards and it's a streamline process for the Commission to certify third-party compliance software. Uh, the potential issue is that we'll need continued collaborative support to update the CSE for emerging technologies. So, uh, this goes towards George's comments about optional capabilities and how we deal with that in this new paradigm, we need to talk about it and we're open to suggestions.

Are there any other questions or comments before we break for lunch? Either here or online? Okay, thank you very much.

(Lunch Break 11:32 a.m.)

MS. BROOK: Martha Brook, with the California Energy Commission. We're reconvening our 2013 Standards Update Workshop focusing on the ACM manuals and software. I was thinking during lunch that some of you who are calling in online may only have joined this afternoon for the Nonresidential ACM portion of the meeting. We did talk quite a bit about our plan for software development, which, uh, apply to our Nonresidential ACM Compliance software, so what I was thinking is if there is any interest for those of you online, if you missed that morning presentation about

our software plans, and we have time after the rest of our Nonresidential ACM agenda, I would be glad to re-present our software plans. And the only reason -- the only way I will do that is if you type into your chat on the WebEx Meeting that you'd be interested in that kind of presentation.

So, uh, the first thing that we're going to talk about this afternoon is a reorganization of our Nonresidential ACM Manual. And basically our current manual is -- combined both the process steps for how the software vendors have to submit and get their software certified by the Commission, with the detailed explanation of the performance rules set that's used in the compliance software. We're proposing to separate those two into two separate manuals. The first, the ACM Approval Manual, would only contain the process pieces for vendor certified software. It would be adopted by the Energy Commission during the 2013 Standards Rule-Making. The content of the Approval Manual would be, uh, the application package that the vendor has to submit for software certification, the -- a summary of the required software capabilities, the optional capabilities that could be included in the compliance software, the software test processes and criteria for approval, and then the software vendor requirements,

such as user support and other things that are in the Approval Manual.

The second half of the current manual would be separated into an ACM Reference Manual, and our proposal is to treat this analogous to the Nonresidential Standards Compliance Manual. It will be approved by the Commission and developed during and after the formal rule-making. It will be published -- approved and published by the Commission well before the implementation date of the standards, but will not be part of the 2013 rule-making. The Reference Manual will document the performance standard rule set, it will explain the standards data model terms, it will explain each rule applied to the proposed building design, it will explain how to compute the performance budget that the proposed building is compared to, it will document the function requirements of the ACM software in detail, the requirements of the data that -- data -- the data that the user has to provide would be documented, as well as the reporting requirements of the software. And, uh, the ACM Reference Manual will also explain the details of the Compliance Certification Test, it will summarize the modeling results contained in the reference method, the current draft -- so the -- we actually have drafts of these documents posted on our

Workshop website.

The current draft manual, uh, format for the Reference Manual is adopted from COMNET, which, uh, I've got a summary of COMNET on the next slide I'm going to go to. COMNET is Commercial Energy Services Network, it's a new system that assesses and rates the energy efficiency of commercial and multi-family buildings. It's the commercial building analogous to RESNET. It's actually, right now, part of the RESNET organization. It standardized the process -- standardizes the process for performing energy calculations by accurately specifying the baseline building, restricting schedules and other operation assumptions, providing credit for reductions in non-regulated energy use, and it establishes acceptance criteria for software based on ASHRAE 140. So, those first two items -- you know, accurately specifying the baseline building, restricting schedules, and other, that's exactly what we do in our Nonres ACM Manual. In fact, COMNET looked at -- heavily at the California Title 24 Nonresidential ACM Manual in the development of COMNET. It's made significant improvements, and enhancements to the documentation, and we're going to be leveraging that to the extent possible. The other part of COMNET is that it's developing a Quality Assurance program to accredit

software, credit raters and modelers, and credit auditors. So that's sort of just an over view of what the COMNET organization is.

Back to our explanation of the Reference Manual. So, what we did is, knowing that COMNET was out there, it was basically a reorganized, enhanced version of the ACM Manual. We leveraged that highly in our reformatting of the ACM Manual. So basically, it provided a much-needed face lift for the current ACM Approval Manual, which it had been years, and years, and years since a really substantive format revision has taken place, and so we're taking this opportunity to do a major face lift for the ACM reference material. We think that the similar formatting between the CEC's Nonresidential ACM Reference material and COMNET will help the user community find information quickly; make comparisons between the two approaches. Basically have an instant familiarity with the document. We'll also, as we go forward, look at the rule set content in COMNET and decide which things we want to adopt. So they've chosen to do the HVAC system sizing mapping -- system mapping rules differently and we see a lot of value in what they've decided to implement, and, uh, there's other examples like that that we'll be reviewing in detail and making decisions about whether we propose those as

basically performance standard rule changes. But we're not prepared to talk about that today.

So, that's it on the Manual reorganization. We talked about that this morning for Residential, it's very, very similar, so I don't expect a lot of questions, but if there's new people online that have any questions?

No? Okay, so we're going to keep going. Oh, Jon, come to the microphone please.

MR. MCHUGH: Jon McHugh, McHugh Energy. Uh, you had, I thought, at an earlier time talked about another process, I believe you had a PEER project that used sort of a regular process of key words, and I believe El Monte, I think was the --

MS. BROOK: Lamont. Uh-huh.

MR. MCHUGH: -- Lamont. And so how does that relate to this comment -- of is there any relationship between those two efforts?

MS. BROOK: Okay, so, there is. Uh, we have technical support contractors now through our Architectural Energy Corporation Tech Support Agreement to start building out our standards data model, and Lamont originally embarked on this effort because they have a PEER research project to develop another version, a really, really sophisticated version of this rules

processing software, but it is not -- will not be ready for the 2013 update. But they needed to do some of this foundational data model work. And so they began that effort, and in the process of, uh, adopting portions of the COMNET material for the ACM manual we realized that we needed to make sure that we weren't just creating a different data model. So now, we're actually -- internally we're calling COMNET Plus. We've, you know, we've also called it the Standards Data Model, so we haven't really finalized on a name for the data model, but we're explicitly forcing ourselves to be consistent, not only with COMNET, but there's also work, you know, nationally to get consistency and a single data model for interoperability. So there's work in the IFC -- Industrial Foundation Classes -- that is -- we're looking at to make sure that we don't create different terms for HVAC, and envelope terms that are in the IFC model. There's also GBXML that we're looking at. The difference between COMNET and the Standards Data Model and the -- a building model that's used for pure simulation, is that we're typically at a little higher level for a lot of the building measures. So, for example, a Standards Data Model might have U-factor and solar heat gain coefficient for window descriptors, where a detailed data model plus simulation would have

all that long list of window properties that Bruce mentioned this morning that the ASHWAT uses for its modeling. So we are trying to be consistent and deliberately forcing ourselves to adopt terms that are already in one of those other data models. John?

MR. ARENT: Yeah, Martha, just to expand on that and --

MS. BROOK: Just say what your name is and --

MR. ARENT: Oh, John Arent, AEC. Uh, related to that but also one of the -- in general, one of the benefits of moving to this format for the ACM, is that the current ACM has a lot of references that are tied to a specific simulation engine -- the 2.1E -- and one of the goals of this, which we can achieve, is to make it essentially independent, or agnostic of the simulation engine used.

MS. BROOK: Great, great. Thanks for adding that. That's definitely one of the values that COMNET provides, and one of the objectives of the COMNET work was to get a set of building descriptors and rules that are explained in -- I'd say English, except I'm not sure engineers use English -- you know, but not specific, but simulation engine specific. So somewhere in between English and Engineering is sort of where we land in the vocabulary world. Uh, any other questions?

Okay, so the next thing I want to talk about is the Nonresidential ACM Reference Method. This is another significant change that we're proposing, and I think is long overdue. For the last several code cycles we've had DOE 2.1E as the Nonresidential ACM Reference Method, which is a piece of software that's not supported by anyone, and is out of date, and nobody uses it for -- well I don't know of anyone who uses it for building mechanical design. So, our -- and this -- we had a soft -- a software-focused workshop back in September and we got stakeholder recommendations to go with this approach and we supported and agreed that it potentially is a big step forward. So, what we're proposing is to switch from the single DOE 2.1E engine reference to a database of representative modeling results. So, we're thinking that we would use the simulation engines that are used by the building design community today to provide modeling results into this reference database. So we're thinking about Energy Plus, DOE 2.3, which is an enhanced version of DOE 2.2, which is you know, set to be released at any date now. We have confirmed that we could have access to DOE 2.3 prior to any official release if the timing of that is delayed in any way. And also the refrigeration version of DOE 2.2. And then Virtual Environment. So, again, if there's any other

software, you know, built mechanical design simulation tools that the building industry is using that they want us to consider for building up this reference set of modeling results we would love to hear comments on that.

We think the benefits of this approach is that the ACM Reference Method will be based on modeling tools used by the design engineers and it will enable our software modeling to model a greater number of innovative system designs and technologies, so for a long time we've had to build separate algorithms for -- to simulate, you know, technologies and systems that couldn't be modeled in our referenced DOE 2.1E engine, and so we've had these sidebar calculations for a bunch of things that we would rather just incorpor -- you know, we expect that, you know, a current modeling tool that's used by the design community will already have that functionality in it and we don't have to do these separate sidebar calculations anymore. And it also allows us to see what these tools are capable of modeling and to start to -- it will make -- give us an easier way to start understanding the value of these new technologies energy-wise and to be able to give them credit under the performance approach. Is there any questions about our plans for that activity?

MS. LENTZ: This is from Bruce. His question is

will the CEC be issuing a HERS-type verification for new commercial?

MS. BROOK: Okay, so I'm assuming the question is asking whether the Commission will have an asset rating approach, which is what HERS is for residential buildings. And we are, actually, developing -- in the process of developing an asset rating system for commercial buildings, and we are collaborating with the Department of Energy on that effort, as well as other regional advocates of commercial building asset rating. But we're not intending to include any of that in our software plans to meet the 2013 standards date. So, that's a separate effort that's -- we have technical support here at the Commission that's working on helping us develop that rating approach. If it's -- if the timing works out and it's appropriate we might consider computing a rating metric within the compliance software, but that's probably as far as we would go for this roll-out of the compliance software. Uh, but it's a good question, because ideally we do want to have this continuum between new building design and existing buildings and we think the asset rating approach is the perfect way to do that. Uh, any other questions?

MR. GABLE: Uh, Mike Gable. Just an informal question about whether the Commission has been informed

or told that other vendors besides Energy Soft would be interested I this new paradigm that you're proposing, that maybe you're going to bet buy-in from other software vendors nationally, or other where, to take design software and try to create a California Compliance version. Have you heard anything?

MS. BROOK: Yeah, actually we have a really good, I think, participation, because -- we actually asked for that in our solicitation, and Architectural Energy Corporation did a great job bringing a lot of vendors to the table, and they'll be on our pack. So, uh, I don't know, do you just want to name them off who signed a letter of participation, or --

MR. CONTOYANNIS: This is Dimitri Contoyannis from AEC. Uh, as part of our SOQ, Statement of Qualifications for this upcoming contract, we reached out to a number of vendors. As Martha mentioned, one of the requirements of the contract was a pilot phase where third-party vendors would actually participate in this effort and, you know, build up the functionality in their software such that they can take advantage of the Compliance Engine. So we spoke with Jeff Hirsch Associates, IES -- the makers of Virtual Environment -- Autodesk, Bentley -- I'm blanking on another one -- the LBNL team that's working on the Energy Plus graphic user

interface project, so those are the --

MS. BROOK: Did you mention Trane?

MR. CONTOYANNIS: I -- Trane -- we did not touch base with Trane yet.

MS. BROOK: Oh, okay. I know they're interested, but it's sort of -- that might happen in -- as a residual of the LBNL work, because they're going to be using Energy Plus.

MR. CONTOYANNIS: Right, right.

MS. BROOK: Okay.

MR. EILERT: Uh, hi Martha --

MS. BROOK: Hi.

MR. EILERT: It's my job to ask the --

MS. BROOK: Can you tell --

MR. EILERT: It's Pat from PG&E. It's my job to ask the simple questions. Uh, so there's a possibility that multiple engines here will be used to create this reference method, so whoever creates an interface to actually do compliance modeling, does that mean they have to talk to multiple engines? OR how does this sort of come together?

MS. BROOK: No, I don't -- I guess I never -- I imagine that could be a future. I never imagined that future. I imagined two different ways that it gets implemented; one is that, uh, if -- what we've just

talked about where multiple design tools that already use their own simulation engine want to have a -- excuse me -- a compliance component to their software. They would -- they still have two choices, they could encapsulate the whole engine and then just port the data from their tool into our engine, get simulations done with Energy Plus and reported -- and the results reported back out. That could be done within their software, or they could just take our rule set and do the development work themselves to map that rule set to their own engine building models, perform the simulation within their native engine environment, and get the reports out that way. So, we're not constraining them to use our engine, it's -- and they -- it's sort of a choice that they have to make about which of those that they want to do. Do you understand? Am I -- you look kind of --

MR. EILERT: It's gonna -- I'm skeptical, but I'll wait until I learn more.

MS. BROOK: I'd rather describe it as puzzled than skeptical.

(Laughter)

MS. BROOK: Any other questions?

MR. ARENT: Yeah, Martha, Jon Arent, AEC. Just to clarify -- we had a discussion on this earlier -- is

it the intent that a candidate compliance software could potentially pass the CEC compliance test for a limited set of functionality, but maybe that software wouldn't be certified to provide compliance under all cases?

MS. BROOK: That's a really good point. And relevant to the reference method because there could be a simulation engine that models standard practice technologies rally well, and want to certify their tool for compliance for everybody who uses those standard technologies, but their tool doesn't have the capability of modeling a radiant cooling system, or displacement ventilation or some other more innovative design. So that's -- so because we have a -- we'll have a reference method that allows us to build certification tests against the reference method, we -- we'll want to be careful because we don't want to, you know, we don't want to create a really complicated certification process, but it makes sense to me that we would -- we don't want those tools to be certified to simulate technologies that their tool isn't capable of. But we do want them to find a market, and if there's a good market for their tool already in those standard designs, and we want them to have a compliance functionality, then I think that we should figure out a way to facilitate that. So maybe there's a very limited

number, like if you have to jump -- you have to do all of the, you know, requirements, and then -- well even now, don't we have some process where they get certified for optional capabilities? Right, so, maybe it's the same as that. Or we have to revisit that and see if it works -- how it would work with this new reference method.

Any other questions? Okay, I am writing a note down and then I am going to move onto the next slide.

Okay, so this is the last, uh, item we have on our agenda. This is the biggest potential proposed change to the performance standard. This is, uh, something that a number of people have visited from time to time over the years and thought about. We're very motivated to see if we can accomplish this, we think it has a lot of potential. So what we're tentatively proposing is a change to the Performance Budget Calculation. We still have work to do to know whether we're committed to this change or not. But basically what we want to do is we want to -- instead of modeling a baseline building to reflect the prescriptive standard version of the proposed building, what we want to do is apply that prescriptive standard to prototype buildings over a large range of a few key building parameters, like climate zone, footprint, number of floors, equipment

power density, and develop a matrix of performance budgets that match our prescriptive standard, including the expected range around those budgets. And we think there's a lot of value here because right now the performance standard is a black box, and it's really unclear to people what you're getting compared to, what the actual, you know, budgets are in these buildings. I mean, it, you know, every building is basically a standard -- has a different expected standard. We think there's a lot of value in explicitly publishing a performance standard, so the idea is that we could actually publish these -- these energy-use targets in a table, in the standard. It greatly simplifies the ACM rule set, so the ability to get other vendors to participate in our performance standard has a huge impact in this area, because if they take the approach where they're trying to use our rule set and their software, the more streamlines our rule set is, the easier they'll be able to make that implementation successful. So the idea is that our performance rules really would only apply to the proposed building, and then you would -- once you've modified the proposed building based on our rules, then you would compare it to a performance budget.

The other real value I see here, in really trying to

change the marketplace to encourage efficient design, is if you have the, sort of, performance or outcome- based objective, then architects and designers can use these published energy intensity targets to understand the -- how their early design decisions are changing whether or not they are meeting code or going beyond code. So even before they jump into the compliance software world, in their early design tools they could be comparing their energy use budgets to these performance targets and know if they're in the right ballpark or not, so we think there's a lot of value there.

Mike --

MR. GABLE: Uh, Mike Gable. So this is the first I've seen of this so forgive me if I'm in a little bit of shock here.

MS. BROOK: That's all right, that's all right.

MR. GABLE: So, we're talking about not having a custom budget for the standard design, or are you talking about having fixed budgets as an alternative, or --

MS. BROOK: Not having a custom budget.

MR. GABLE: Okay, I would be strongly opposed to that for many, many important and complicated reasons that we can discuss offline, but basically the main point is that if you don't run the same building with

prescribed measures under the same simulation, under the same weather, under the same conditions, you just don't have a valid comparison for looking at the standard design.

MS. BROOK: Yeah, so we've done -- we're going to present some analysis, and we want you to comment on that, but I think, I think we're -- I think we have an approach that would work.

MR. GABLE: Okay. I'll just say that we moved away from those, you know, for a good reason --

MS. BROOK: Right, right.

MR. GABLE: -- and it's going to take an awful lot of convincing for a lot of people to believe that that is a sufficiently good reason to go back to that system, so --

MS. BROOK: So --

MR. GABLE: -- I'll keep an open mind --

MS. BROOK: Yeah --

MR. GABLE: -- but I'm quite concerned about this.

MS. BROOK: And we definitely want your comments as early as possible, so that we can address them. So--

MR. GABLE: Okay, thanks.

MS. BROOK: So, the potential issue, and one of the reasons that, uh, a custom budget approach has been

used in the past is because it -- a custom budget basically normalizes out potential errors in the software because you're looking at a relative -- you're looking at two simulations made by the same engine, so all of the noise and inaccuracy and uncertainty kind of wash themselves out because you're looking at the relative comparison between those two. And what we'd be doing here instead, is basically saying we trust your model to be right. And it's an absolute comparison against another model that we trust to be right, and that is what's the basis of comparison. So, from our point of view it doesn't make a lot of sense to be worried about the accuracy of the simulations for code compliance, when we're using those same design tools to make decisions about the systems that go into real buildings and use energy for the next 20-30 years. So, uh, that -- so that's kind of where we've landed on that, and we'd love to hear your comments on that.

So, uh, the next thing we're going to hear from Dimitri, and he's going to talk about the work we've done, and sort of where we are now and what we think we're going to do next, and love to hear your comments when he's done. So, do we --

(Off-microphone conversation setting up PowerPoint)

MR. CONTOYANNIS: Dimitri Contoyannis, AEC. I'm going to talk a little bit about the results that we've generated so far, the scope that we've investigated so far. I'll start by saying that, and we're just beginning this analysis, there is still quite a bit of work left to do. But the results that we've generated so far, they give us an indication that there may be some feasibility to this approach, so again, you know, we'd be very interested to hear your feedback on the approach, any suggestions on how we could make it as robust as possible. So, obviously there is a big change.

So, you know, I think Martha already laid out the goal of the study. Essentially we're looking to see if we can set a fixed EUI targeter energy budget based on building type and climate zone. Potentially there might be some other variables that will impact what that energy budget would be, so we decided to start by limiting the scope of this study, by starting with one building type, which was an office building. We started with a reduced number of climate zones, looking at four of the climate zones in California, and we also started by creating a list of design features that are the ones that would likely introduce variability into what this energy budget would be. And then, you know, we

ultimately performed several thousands of simulations to start to get some preliminary results and make sense of them all. So, you know, ultimately the outcome that we're looking for is, is it possible to set a -- an energy budget with a narrow band, you know, something that is very predictable. And, you know, I'll show you what we've come up with so far.

So we started with the medium office building, this is based on the DOE Commercial Reference Building in Energy Plus. You know, the reference buildings, as published on the DOE's website are based on ASHRAE 90.1 2004, so we started by changing the inputs to represent title 24 parameters. So things like, you know, wall types, window types, etcetera. Again, you know, we started by looking at four of the climate zoned in California. We tried to pick a diverse range of climate zones, so a mild climate zone, Climate Zone Three, one with a hot summer and a relatively cold winter, that was Climate Zone 13, a hot and dry climate, which was 15, and then the colder mountain climate, which was 16. So, those are the four that we started with.

So, talk about the modeling procedure that we took. So as I mentioned we tried to list out various model inputs and classify them. We came up with three different categories. There are design features that

will be different between your proposed and reference building. These are the things that you can take credit for, for your proposed building, things like lighting, power densities, you know, HVAC efficiencies, and so on. Now, because, for the reference building those values are all, either mandatory or prescribed, we kind of ignored that category for the sake of this analysis and just used the mandatory or prescribed values. The second category are inputs that are neutral between the baseline and the proposed building. Things like, occupancy density, schedule set points, and so on. So again, for the sake of our modeling, we used these prescribed values for our inputs. And lastly, the third category, this is the -- sort of the one that was the focus of our study. These are building-specific features that are not dictated in any way, shape, or form, by Title 24, so things like geometrical features of the building. You know, an architect has great flexibility on what the building form will be, and we actually have a list on the next slide, which I'll talk about, but these are the key elements of this analysis. We want to understand things that are not dictated by code, that will likely have an impact on the energy budget. We wanted to really focus on that area. So, these are the key variables that we've listed, so things

related to the building geometry, like the building area and the aspect ratio of a building, uh, the building height and the number of floors, floor to floor height, ceiling height, window to wall ration. We looked at building orientation, unregulated loads, like receptacle loads. You know we figured those would have probably the largest impact. And then the mass of the construction materials, so the exterior finish of the façade.

Uh, so what we did to run our analysis was introduce input ranges for each one of these variables. We picked a sort of baseline value for each, and then modulated that value up or down, you know, within a certain tolerance range. So, you know, for the aspect ratio we looked at three different aspect rations, we looked at building heights of two, three, and four floors, floor to floor heights of 12 feet, 13 feet, 14 feet. We looked at a couple different window to wall ratios, 20 percent and 40 percent, which, would introduce, you know, some variability into the equation, zero degree and 90 degree rotations, and a wide range of receptacle power density. We basically started with the COMNET default value and modulated it plus or minus 50% with ten percent increments. And lastly, lightweight versus heavyweight façade materials. So you can see, you know,

we came up with a large number of different permutations here, and ultimately what we did was run every possible combination of these modeling inputs to see how wide the variability of the results were.

So we'll start by looking at climate zone three. And, you know, what we did first was look at what was the impact of changing just one of the variables. We were trying to nail down which of these variables had an impact just on its own. So you can see here that in this case, in this climate zone, building orientation actually did not play a huge role in the results, but you can see that the number of floors did. You, know, you can see there is a slope to that curve, plus or minus four percent, or so, in terms of the energy use intensity. So you know that's not something you can just ignore, whereas in this case, orientation, we found it wasn't, you know, having a huge effect on the results.

Moving on to the next side, uh, aspect ratio -- interestingly enough we found that it did not have a large impact on the results, so this actually led us to investigate that a bit more closely, and I'll come back to that after I've gone through the next couple slides. Floor to floor height, again, did not have a huge impact on the results. But what you can see here, the one

that, as we predicted, would have the biggest impact was equipment power density. But modulating the equipment power density -- and this is an unregulated load in Title 24 -- you can see that it has a pretty much a linear impact on the building's energy use intensity. So. Clearly, that's the biggest impact, and you know, it's something we need to think really hard about how we want to incorporate that element into this new proposed budget approach.

Now, what we've done here is this is a scatter plot of all of the simulation results in climate zone three. And you can see that once you know what the plug load density is and how many stories you have in your building, well, all the other results fall within a very tight cluster of results. So when you know the plug load density and the number of floors, you can predict with some confidence what that energy use intensity is going to be. So, this was very encouraging and it kind of led us to believe that, well you know, this is probably something we should investigate further, and from there we sort of expanded out the analysis.

So, you know, as I mentioned before, when we were looking at aspect ratio we found that it didn't have a huge impact on the results. So how we modeled aspect ratio previously was keeping the building's area

constant but simply changing the aspect ratio of the building. Well, what we wanted to look at next was, well, what if you keep the aspect ratio constant but actually scaled the building up by a factor of two and a factor of point five. So, basically, shrinking it in half, or doubling the building area while keeping the aspect ration constant. We wanted to see, well, did that have a bigger impact on the results than simply changing aspect ratio alone. And, in fact, we did find that it did have a fairly significant impact, you know. By shrinking the building -- which you can see here, this is the area facto of point five -- uh, it had quite a significant increase in energy use intensity. By doubling the area we actually saw a small drop in the energy use intensity. Now, looking at the scatter plot here of all the results again, you can see now that you don't have this very tight cluster of results. It's very difficult to pinpoint where the energy use intensity should fall. So we found that the footprint of the building was another key factor here, in terms of what the budget should be. Now, because we couldn't simply pick a value from the scatter plot, we did a bit more investigation on how the results varied, and those will be summarized in the next series of slides.

So, here we see several different graphs, and

essentially what you're looking at in most of these are a max, min, and average EUI target. So, looking at this first graph, we tried to group the results in terms of the number of floors and the area factor. So, here in red we're looking at an area factor of point five, in green it's an area factor of one, and in orange at the bottom this is the area factor of two. So you know, you can see that when you know the number of floors, the equipment power density and the area factor, well then the range starts to become quite small again. So you do need to know the three values to pinpoint where the CUI budget should fall.

So the next thing we wanted to investigate was, well, you know, is it possible to ignore area factor and number of floors and just look at the floor area of the building. So here you can see at the bottom we're plotting out floor area, here in this Y axis it's energy use intensity again. So, you know, what we see here is that, well, you know, it is a fairly predictable curve of results, and you know, for a given square footage of a building and equipment power density, you know, there is a fairly narrow band. We did find that there were a couple areas where that band actually was wider than the rest of the curve. And it seemed to point to the points to where there were multiple simulation files that had

the same building area, so this could be some combination of number of floors and building footprint that have the same overall area. That's where we found that the curve was the most divergent, actually. So that's an area where we certainly want to dig in a bit deeper, and see, well, you know, what if we have other shapes, sizes, that have the same square footage, how much of a spread are we going to see?

Now, coming over to this curve here, in the upper right, again what we were doing here is pinpointing a given area factor, a given equipment power density, you can see again that for a certain number of floors, how wide is that band. And you can see it's actually quite tight. When we zoom in, in this bottom graph, you know, regardless -- we're plotting, uh, window to wall ratios of 20% and 40%, and even with that variability you still have a band that's only about three or four KBtus wide. So, again, you know, what we find from these results, is that if you know a few factors about this baseline, you know this sort of budget building, you can really pinpoint where the EUI range is going to fall. So this was for Climate Zone Three.

The next series of slides are for the other three Climate Zones, so I'm going to really quickly walk you through those. And you can see that the actual values,

uh, may shift up or down, but the shape of the curves is actually quite similar regardless of the Climate Zone. So, you know, here you can see the maximum of about 65 KBtus in Climate Zone 13. Climate Zone 15, that shifts upwards, but the shape of the curve is actually quite similar across all of these different Climate Zones. You know, Climate Zone 16, shifting back down, but the shape of these curves, again, is quite predictable. And, you know, when you really zoom into the final curve, you can see that the variance is quite tight when you know certain factors, like equipment power density, the building's footprint, and the number of floors. So, that's where we are so far. We've looked at this office building, and you know, it seems to point that there is some feasibility to this approach that we've taken so far. Obviously there's a lot more work to be done to investigate this further, and we'd like to look at additional building type, in particular we'd like to look at a mixed-use building type, and building types that have various space use classifications. You know, we're going to maintain our Climate Zone scope at four Climate Zones, you know, because we think that covers, uh, you know, a wide range of the climate types in California. One of the things, though, we haven't investigated yet, and that is crucial to this study is

what is the impact of an alternate simulation engine. You know, so far we've done all our analysis using Energy Plus, but, you know, moving forward we're going to take at least a handful of the simulation runs, reproduce them in DOE 2.2, and try to understand how much variability that introduces into the equation.

And, again, moving forward, these are the next steps that we intend to undertake. We'd like to look at retail and school buildings. So, for the retail, as I mentioned, multi-use building type is one of the trickier things to pinpoint for a budget -- a fixed budget type approach, and that's one of the good advantages of a base line building, you know, you can actually model the percentage of retail to office, for example. So what we're going to try to do is hone in on that a little bit. So we have two test cases for the mixed-use building. One is to perform additional analysis on the office building, but replace the ground floor with retail. Case two is to model the stand alone retail building, model the stand alone office building, and see if there is some methodology by which you could combine the results from those two building simulations to produce the same or comparable results to our test case one. And then the other building type that we're going to investigate is the secondary school building.

Now, this is a building that has a divers type of space use types, there's classrooms, cafeterias, auditoriums, and so on. Now, because there's diverse space use types, we are definitely going to be tracking the percentage area of each one of these space types to understand, you know, what impact that will have on the results. You know, say if you change the percentage offices in this building, you change the percentage of classrooms in this building, how does that change the budget, and is it predictable? And, you know, that's something that we don't know the answer yet, but stay tuned, we'll have results on that very soon.

As for the approach for the alternate simulation engine, I touched on this briefly. You know we are going to be looking at DOE 2.2, picking a handful of the building variance that we've already looked at in Energy Plus and determine what EUI values we generate with an alternate simulation engine. So, again, you know, those results will be forthcoming, and hopefully we can talk about that in an upcoming workshop here.

MS. BROOK: Okay --

MR. CONTOYANNIS: At this point, I think that's, uh --

MS. BROOK: Great. Thanks Dimitri. Questions from the room?

(Anonymous off-microphone comment)

MS. BROOK: Go ahead, chime in.

MR. MCHUGH: Jon McHugh, McHugh Energy. Uh, for the first set of simulations in Climate Zone Three you didn't; find that much impact of orientation. When you looked at something like Climate Zone Thirteen, where now all of a sudden you've got cooling loads and more solar gains, did you find that then the orientation became important? I didn't see that kind of analysis for the other Climate Zones, so I was kind of wondering --

MR. CONTOYANNIS: Yeah, we didn't include that in the presentation --

MR. MCHUGH: Yeah --

MR. CONTOYANNIS: -- it was a bit more pronounced, it wasn't a huge impact. Uh, what we did for the other Climate Zones, you know, you saw more of the detailed analysis for all four of the Climate Zones, but you can see that, you know, when we had certain variables like equipment power density, and area factor, and number of floors, whether, you know, all of those orientations were included in the max-min-average where you -- you know graphs where we had the four plots, in fact let me go back -- so, in these analyses here, where you've looking at these bands here, this is the

max-min-average of all the different combinations of simulations that we ran. And you can see that when you modulate things like the façade material, the orientation of the building, the aspect ratio, even changing all those values, you still have a very narrow, predictable range of EUI, regardless of the Climate Zone.

MR. MCHUGH: So, I'm confused a little bit. It looks like you have three points for each line, and you only have, you know, only six lines. Are you actually getting the various orientations, is that what you're showing there?

MR. CONTOYANNIS: Yeah, so this isn't -- this is no longer the scatter plot of all the runs. We're looking at the -- if you -- let's say you have 500 simulations for a given equipment power density, area factor, and number of floors. What we've done is pick out the maximum value, the minimum value, and the average value of all those 500 runs, and that's all we're showing on these plots here.

MR. MCHUGH: So, that band there, you know that -- in the Climate Zone 16, it looks like it's, uh, 10 percent scatter, something like that, is included in all those, is that what you're saying? It's --

MR. CONTOYANNIS: That's right.

MR. MCHUGH: Okay.

MR. CONTOYANNIS: And for each one of these Climate Zones we had about 1000 simulations run, plus or minus 10 or 20.

MR. MCHUGH: So, related to that -- I mean, I guess what I'm seeing here is that in some of these cases, like for instance -- I don't know -- so I guess this is just number of -- so you're saying for Climate Zone 16, your best, your best metric, which I guess is that top one is, what -- so I guess I'm confused a little bit -- what's the difference between the top one and the second one? Oh, it's just expanded --

MR. CONTOYANNIS: Here and here?

MS. BROOK: Yeah.

MR. CONTOYANNIS: We're changed the scale. This is a zoomed in view so you can understand a little bit better how wide that spread is.

MR. MCHUGH: Okay.

MR. CONTOYANNIS: So, you know, we -- here we're plotting both of the window to wall ratios. So this is to show the window to wall ratio, it does have some impact on the results, although it's not as pronounced as you might expect.

MR. MCHUGH: And, uh, and you're using prescripted SHGC and all those kinds of things, I see?

MR. CONTOYANNIS: That's correct, yes.

MR. MCHUGH: Uh, I guess the thing that's, you know, when we've looked at some of these things, in the past, you know, the issue is, is okay, so I have a particular configuration that I'm in, you know, let's -- you're not showing that much difference, uh, for Climate Zone 16, but I thought for 13, I thought you were showing like 10 percent difference of something like that?

MR. CONTOYANNIS: Let's go back -- so we're looking here. Is this, uh -- so again, you know, the dark lines here are the 20 percent window to wall ratio, the light blue lines are the 40 percent window to wall ratio, so you can see the minimum value is about 46 or so. The maximum value is about 49. So, it's a pretty small band.

MR. MCHUGH: Six percent. Yeah. So if you think about, uh -- you know, if you look at what people do to comply with the various efficiency programs, their targets are 15 percent. So, this is on the order of somewhere around a little bit less than half of the total difference between a code compliant building and a, actually, fairly good building in terms of, you know, you give incentives for that, and you know, if you look at what tier one is, you know we're saying, you know,

we're 15 percent beyond code. You get halfway there just if you just happen to be, kind of, you know -- not the particular -- you know, the low one versus the high one on one of your typical values. And the question is when we look at buildings, you know, a lot of times we don't get to choose orientation. The side of the -- especially if it's infield -- the side of the -- shape of the space, or of the plot defines sort of the orientation of your building. And so then the question is, is you know, I got lucky in the draw, I got a fairly nice site. Does that mean that if I use kind of this average baseline, should I actually have kind of worse windows and worse air conditioning just because I kind of, you know, drew two aces, you know, when I got my plot? And, you know, vice versa, you know if -- hey I'm building, you know, inside of a location that has a more challenging site. Do I have to do something extra because the site is challenging? I mean, those are the -- some of the kinds of questions that this brings up. And then finally, it looks like you have a number of metrics you have to consider. So now, you've got 16 Climate Zones, you're shooting for this target, is that really -- I mean it's probably nice to have in the User's Guide that these are likely what your targets are, but why would you necessarily set the basis of the

standard on these targets, rather than having some guidance for a designer that, you know, this is what you're shooting for, and what you should be trying to shoot, you know, go beyond?

MS. BROOK: I don't, I don't know about you, but we've heard from many. Many people how complicated the performance standard is and how difficult it is to implement in software, and how it's, uh, really not encouraging good design. It's not changing the -- it's not changing the design practices by anybody, it's not like we're really knocking it out of the park and building, you know, fundamentally different buildings in California commercially than we are anywhere else in the nation. So, we're trying to change the paradigm, or we're trying to look at ways that we could do that, and the more transparent we are, and the simpler we are in the performance standard, the more we'll be able to integrate compliance standards, compliance and investigation into design tools. So that's definitely an objective that we have.

MR. MCHUGH: So, I guess I'm still a little confused, because, uh, you know, essentially the performance approach, what it does now is it says, here we're modeling this building that matches your prescriptive requirements, so the designer already has -

- all they have to do is look at the prescriptive requirements and they essentially know what that target design is in terms of the features of the building, as opposed to a KBtu or TTB KBtu value. Now if you give, you know, a fixed value, how does that somehow increase the innovation or the inherent --

MS. BROOK: Well, it definitely helps in the early design phase, because they don't -- they're not going to be looking up the standards to see what prescriptive requirements are for things that are down the road in their design process, so --

MR. GABLE: Let me just speak to that a bit. Uh, I think -- first of all I understand the problem the way the Staff sees it, so I think I appreciate where you guys are coming from in terms of why you're taking this approach.

MS. BROOK: Uh-huh.

MR. GABLE: I think one simpler solution than going down this road, which I'll speak to additionally in a minute, is that, uh the ACMs could make it clear on the screen and in print out what is the standard design for your building that your being compared to. So, but a flaw in the program right now is it's not always clear when you're running a piece of software what you're comparing yourself to component by component.

MS. BROOK: Uh-huh.

MR. GABLE: So, one thing the ACM manuals could do is make the software printout both on screen, dynamically, and also in a concise summary, for your building as you've currently proposed it, what are you comparing yourself to -- lighting, mechanical envelope, water heating, and so forth -- because that way, I think to speak to John's point, you'd help the designers understand at least what your components are compared to. The larger issue here I see is that, uh, whatever number you pick for a fixed budget, I can guarantee you, you give me that fixed budget, tell me what the parameters are within which -- or within the table that define that prefixed budget, I can get variability, I can create buildings -- which are not wacky, which are real buildings, to John's point -- which are going to vary 20-25 percent. I can find a way to create designs that are going to completely blow this out of the water. And that's the problem, it's not that this isn't a good idea, it's just that in reality buildings are weird, real life creates these scenarios you could never envision -- TIs, strange building conditions, orientations -- where the only fair and legitimate thing to do is have the software run the standard design for your building as you've proposed it, and say that's the

accurate, correct interpretation of the standards for your building, and that's what you're comparing yourself to, because otherwise, as John's saying, it's not a six percent variability. I can tell you it's going to be a 10 or 15 percent variability. It's going to be a variability that equals or exceeds the margin that the utilities are trying to achieve in incentives for exceeding code.

MS. BROOK: So, so, so I appreciate that, and I understand it. I think where we are is that we are kind of stuck in this standards compliance world and how do you ever get to outcome based codes, where you say, look you have to -- or is it even appropriate to say you have to meet this budget, in one way or another that's the budget that your --

MR. GABLE: Yeah, I think, you know, we struggles with this for years before the custom budgets, and I think, unfortunately, you know, it's kind of like going back to the Dark Ages for the wrong reasons. I think that the problem that you are trying to solve is a legitimate problem. I get the fact that it's complicated for software developers to deal with this. I was hoping the compliance rule set would basically help designers create the standard design version of their building somehow. That they would be able to use

these new software development components to create the standard -- the custom standard design -- for their building, which would hopefully prevent the need to go down this road. But it sounds like you're saying that what you're envisioning, as far as the tools go, that that's not going to be something that will help.

MS. BROOK: Oh I think it will help, but in reality you still have to maintain that rule set, and Staff and consultants still need to understand how to do that, and -- I mean another approach, which definitely we can consider and move forward on, is just really streamlining the rule set. Because we have so many complications in there, that it goes way beyond that level of variation on what you're doing --

MR. GABLE: Sure, sure --

MS. BROOK: -- I mean, it's just --

MR. GABLE: Let me give you some other examples. Uh, I wish Martin were here today, but -- you know, the standards --

MS. BROOK: -- been on our team and has every ability to chime in --

MR. GABLE: Okay, but let me give you an example of why I think this is going to be a problem, because based on your building -- let's say you take classrooms versus conference rooms. There are certain prescriptive

requirements for demand control ventilation for certain occupancies and not for others. Buildings, in fact, are mixed occupancy, even though you call them an office building, you know, they are in fact, frequently a mix of a lot of different building sub-occupancies. And the standards are very specific with respect to, gosh, the lighting allowed in those things -- there are a whole bunch of specific individual prescriptive requirements for individual sub-occupancies in the standards.

MS. BROOK: Uh-huh.

MR. GABLE: If you don't try to capture those in some meaningful way -- well, if you capture them in your proposed building, because you're trying to model it accurately, it seems inherently sensible, in fact, you know, the only logical thing to do is to encapsulate, incorporate those specificities in the way you're establishing a target for that building. Otherwise, to me, just conceptually, it's really, I mean it's apples and oranges. And again to John's point, if we're trying to get people to exceed code, to do better than code, I think code has to be established in a way which is technically really valid and has credibility. And my fear is that if I can come up with a way of blowing this out of the water and showing it's just not valid, it's just -- not me, it's just the whole universe of people

out there will scream that we're back to fixed budgets, and it's, as John's saying, sometimes you get buildings which are just hard to pass. Well, is it going to be because it's really hard to pass, or because some lucky unfortunate circumstance of the way that's building's constructed, or configured, or an occupancy which makes it lower down on this curve. It -- I don't know, this is really disturbing me, so, enough said.

MS. BROOK: No, I don't think you should be disturbed. It's not -- you know, this is a very -- this is like Dimitri said, this is a preliminary step. We've got -- we have had, you know requests to think about the paradigm shift, and so we decided to put it out there.

MR. GABLE: Right, so I think the direction I would go definitely, as you're suggesting Martha, is looking at ways of cleaning up and simplifying the custom budget generator, so that maybe - maybe in some respects it's easier for software developers and help to incorporate a rule set that sets the standard design for the building, without being too grossly -- again, does the danger of going in this direction internally, within even the custom generator, it --

MS. BROOK: Right. And the other thing I think that we really wanted to figure out how to do is be transparent about what the performance standard is.

Like, what does it mean --

MR. GABLE: Right, so I think --

MS. BROOK: -- what energy budget are you achieving?

MR. GABLE: Right, so again, I think there are ways of having the software tell the users in the building department what they're comparing themselves to, which is not being done currently --

MS. BROOK: Okay, I think that's --

MR. GABLE: -- which could be done very, very much better than currently, which is not at all, so --

MS. BROOK: Okay, I think that's a really, really good idea. I appreciate that, and I appreciate you providing your comments.

Okay.

MR. HON: So this is Tianzhen, from LBNL.

MS. BROOK: Yeah, hi.

MR. HON: Hi. So I have a question. So it sounds like this can be an, you know, an alternate compliance part, right, you've seen the part budget. So instead of using the simulation to get its budget, I mean we have this database, the national key database, and also have the energy standard of Portfolio Manager. So maybe based on those, and then we have a target, like you know, what's the percentage, you know, reduction

from those energy use? Use for the custom budget.

MS. BROOK: So, you actually -- you want to use measured, uh, measured energy use from Portfolio Manager or one of your characteristics database, like CBECS and CEUS, in some way to develop custom --

MR. HON: Yeah, yeah, actual energy consumption, but then we determine what percentage, maybe 30 percent, I don't know, you know, better than those.

MS. BROOK: Okay, I'm having trouble understanding your specific proposal, Tianzhen, I don't know, uh, if you want to --

MR. HON: Uh, so, right, so this would be a compliance part for the -- I mean Title 24 standard, right. So we are targeting like 30 percent better than existing buildings, or --

MS. BROOK: Oh, I see what you're saying. You want us to put targets out there for what percent better is our standard than the median commercial building in California, or something like that?

MR. HON: Yeah, use the custom budget, yeah.

MS. BROOK: Okay. How does that, how does that relate to the custom budget? I'm confused?

MR. HON: What you're trying to set a budget, right, so the budget can be based on the existing buildings, actual energy consumption. And then we set a

target like 20 percent better than that.

MS. BROOK: Yeah, that would be one way to do a performance budget, or an outcome-based budget. So, okay, I'll have to think about that, but thanks for the suggestion.

MR. HON: Uh-huh, sure.

MS. BROOK: Anybody else? Yeah, John.

MR. ARENT: Uh. John Arent, AEC. Yeah, just related to Tianzhen, I had kind of a similar idea that --

MS. BROOK: Uh-huh.

MR. ARENT: -- uh, you know, you talked about one of the goals as being having a performance- based outcome, and to some extent the asset ratings would provide you that, you know, and they wouldn't, you know, initially might not be tied to compliance but that would be one way to get there. Uh, I had a couple kind of specific examples -- these are probably minor examples, I guess they both point out the trouble with doing the performance target, as well as pointing out the complexity of the ACM.

MS. BROOK: Uh-huh.

MR. ARENT: Uh, one example is, you know, things that are typically design parameters, such as, say, system head, or fan static pressure, uh, you know if

you -- if your prototype building was based upon a fixed value for those, like say for a chilled water, condenser water head, you could be penalizing buildings that just have higher design requirements based on their layout or whatever. You know, another example is, there's a combination in the ACM for having additional fan power for special filtration requirements. So if you have special filtration you can -- your budget fan power goes up slightly. Again, it's probably -- it might come out in the wash in terms of the absolute energy use --

MS. BROOK: Uh-huh.

MR. ARENT: -- but I think things like that -- any other variables basically that are not fixed in the ACM that are -- where the baseline and proposed values track each other, where they're neutral, I think we would need to look at to see how those affect the energy use. And, again, I think this is something we plan to look at, but the -- you know, I would think that the space type definitions within the building that was already mentioned would have a big outcome on the energy use, since even for an office building you can have a number of occupancy types, each with their own plug loads and lighting loads allowances and occupant densities.

MS. BROOK: Uh-huh.

MR. ARENT: That's a couple other minor things, but those are the kids of things I think we probably need to look at if we move towards this approach.

MS. BROOK: Okay. Yeah, and you know, what I'm hearing are -- they're really, really good comments, and I, uh, you know, I -- we need to think about how we go forward. We probably don't have the resources to do the exhaustive analysis we would need to satisfy ourselves and our stakeholders that this approach would work. But we're very interested in achieving some of those objectives that I mentioned at the beginning, and figuring out ways, and love to hear your suggestions about how we can improve our performance standard in ways that really help people, uh, know early in the design process what an energy use budget ought to be to meet or exceed code, and without requiring compliance software at that stage, and, uh, and simplifying and making more transparent our performance standard. So, uh, so I guess I'm glad I freaked you out a little bit because we -- those are really great comments, and we hadn't thought of all of them, and, you know, I'm the first to admit that I want to go for things that are bold, and if they -- if there's a way to figure out how to get those objectives in a more appropriate way, then, I would love to have your participation and let's work

that out. So, thank you very much.

Yeah, Jon.

MR. MCHUGH: So, just one last comment on this, is that each time the code gets updated, this kind of analysis would have to happen again, and you know, the question is, you know, we have more time this time. It probably doesn't seem like you have much time, but next code cycle supposedly is only three years --

MS. BROOK: Uh-huh.

MR. MCHUGH: -- so, uh, this actually creates kind of a burden for the Commission moving forward, if you actually do go this approach. And, you know, maybe, you know, what makes sense is just to try out, you know, having the sort of advisory kind of thing that, you know, here's what our projections are of what are reasonable targets for the designers to use for design. It's not a code compliance thing, it's just -- it's actually a design aid that's either in the manual --

MS. BROOK: Right, right.

MR. MCHUGH: -- or in some kind of design document that you might publish on, you know, EDR or one of those other --

MS. BROOK: Yeah, so we could definitely -- I think that's a really great idea, and I think it is appropriate to think about how to put that in the

supporting information for the standards. The other thing that we could do, if you think about our going forward, since we are intending to collect compliance information much more rigorously, is we could actually start to collect. And again, if we reported the standard design information and budget on every -- and started to build a database, we could build this the other way right, by actually, uh, querying our compliance information and seeing what the range is on that. What are the energy budgets that we're computing, right --

MR. MCHUGH: You'd also get to see the full range of deviations that John was just talking about, whether it's filtration, pump head, all those other things that are allowed to float. You could actually see the range and how much does that actually have an impact.

MS. BROOK: Right, right. No, that's a very good idea. Thanks.

Any other questions from -- okay.

MR. YASNY: Anybody online want to talk?

MS. BROOK: Okay.

MS. LENTZ: This is from Jamy Bacchus. Uh, I'm not convinced simulated EUI budgets are the way forward. But I support exploring alternate approaches to

compliance. Is the CEC also reviewing CEUS as a valid method? If you opt to further explore the simulated EUIs, why not alter the shape of the floor plate to see if an optimized shape, which maximizes day lighting and envelope gains to minimize UEI for a given gross area? I'll bet you would need to fix the building parameters to fit on the specific site. If you went further you could capture change and façade costs, versus energy budget.

MS. BROOK: Okay, thanks Jamy. I didn't hear a question there, so I don't feel compelled to answer it. Uh, I guess I'd say that in regard to CEUS, we are -- we will be using CEUS in determining what the median energy use is for different commercial building types with our asset rating development. And we could definitely consider figuring out how much better our performance standard is than that median value. I don't -- I think we still have all the same issues that Mike and John raised, though. I don't see how having a different, uh, way to determine a budget changes any of the issues that they raised.

Any other questions? John?

MR. ARENT: Uh, just one last comment, it's probably obvious. But is we were to go to a performance target, such as this, where it's absolute energy use

where we're modeling, then we'll definitely need to look at how the products and energy performance of different tools look, so that people don't try to gain the system, and use one tool for a particular, uh, condition of building type.

MS. BROOK: Right, right. Good point. Online?

MR. YASNY: It's a question about, or a comment about spray foam. And I'm just going to let him know that we have a meeting coming up on spray foam, that's kind off topic.

MS. BROOK: Anything else?

MR. CONTOYANNIS: I'd just like to address one of the points. You know, a point was brought up a couple of times about various base types, and how that will impact the energy budget. So that's one of the primary reasons why we're looking at mixed-use and these school buildings, because they do have a diverse space use classification, and we are going to try to make sense of how that impacts the final results. Uh, another point I'd address, and you know, I don't know if there's a good answer to this one, but it was the question of, now if you have a site that is inherently limited in terms of what you can do about things like orientation, and so on, you know, should you be penalized as a result of that? Well, if the end goal is

to use less energy, you know, if you're in a site that inherently forces you to use more, my personal feeling is that, well then yes, you should have to try harder to minimize your energy consumption. You know, but that's more of an opinion than anything else.

MS. BROOK: Any other questions before we conclude the workshop? Oh, was there any votes for a revisit to the software planning that I talked about? Good, okay. Alright, well thank you all, online, and thank you -- yeah.

MR. SHIRAKH: Did you mention about the July 15 Workshop?

MS. BROOK: I mentioned it thins morning, I'll mention it again today. We're having an additional Standards Workshop on July 15, where we're talking about a number of things right? Mostly the Residential packages, but --

MR. SHIRAKH: Mazier Shirakh, Staff. Yeah, there's a number of topics, I think about six or seven. The most important probably the Residential 2013 Package A. And there will be a refrigerant charge --

MS. BROOK: Was HVAC Zoning on there too?

MR. SHIRAKH: -- HVAC Zoning, uh, hotel/motel keycard, uh, I can't remember, there's two other topics on there too, so -- this is Friday, July 15th.

MR. GABLE: Just a quick question. Do you know when, roughly, you'll be coming out with the Nonresidential Package stuff? Maybe in August or September, possibly?

MS. BROOK: Uh, I don't -- I'm not in a good position to answer --

MR. GABLE: Okay.

MS. BROOK: -- so, uh. Do you have a good answer Mazier?

MR. SHIRAKH: For the Nonres, we don't have a -- haven't set a date. But we're not going to have time to do it on the 15th, because it's already a full agenda.

MS. BROOK: But we still have two dates, July 21st and 22nd --

MR. SHIRAKH: Yeah, July 21st and 22nd for the REACH Standards --

MS. BROOK: Maybe we could use one of those days --

MR. SHIRAKH: We can use one of those days --

MS. BROOK: -- or half of one of those days?

MR. SHIRAKH: Yeah.

MS. BROOK: All right. Thank you, good question. Anything else?

Thank you very much, and we'll talk to you later.

(Thereupon, the Workshop was adjourned at 2:16 p.m.)

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